6-7-2004

Spring rain and soil erosion

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Spring rains can come hard and fast as we experienced last week, causing substantial soil erosion when soils are most vulnerable because of degraded crop residue cover, soil preparation by tillage, and no crop canopy. The soil profiles in most of Iowa are now filled to capacity with water. The profiles are at or near saturation. Therefore, the intensity and amount of rain we received have exceeded the soil capacity to filter water and minimize surface runoff even in fields with the most adequate conservation practices.

No-tillage corn field after a week of 0.5 to 1.5 inch scattered rain showers in Northwest Iowa.

Enlarge [1]

Conventional tillage corn field after a week of 0.5 to 1.5 inch scattered rain showers in Northwest Iowa.

Enlarge [2]

The lesson from such events is to look at the degree of damage caused to fields with better residue cover, by such uncontrollable rains, versus the intensely tilled fields. How does damage happen? In a normal rainfall, raindrops six millimeters in diameter hit the ground at 20 miles per hour. The cumulative impact of millions of raindrops hitting the ground in a hard-hitting spring storm rainfall can be incredible, dislodging soil particles and "splashing" them up to 3-5 feet away.

The splashed particles clog soil pores, effectively sealing off the soil surface and leading to poor water infiltration. Instead of soaking into the soil, rainwater collects and moves down-slope in sheet or rill erosion, forming gullies and carrying soil particles. An effective soil conservation plan, which limits exposed soil and rain splash erosion, also depends on observation and maintenance. Spring is as good a time as any to develop a new and different strategy for addressing conservation planning.

What are the lessons of the rainfall events over the last weeks?

Heavy rain in such an intensity that causes significant property and soil damage is an opportunity to examine what can be done differently in the field to minimize, if not control, soil erosion. Some recommendations are:

- Look at the pattern of surface runoff and the placement of buffer strips on the field when directing surface runoff and minimizing sediment transport.
- Examine your choice of tillage and compare it to other fields in the area, to evaluate the degree of damage caused by soil erosion in each conservation system.
- Evaluate the residue cover, the uniformity of residue distribution, and residue effectiveness in minimizing soil erosion.
- Document your field conditions with photos, if possible, and assess the water ponding on the surface under each tillage system.
- Evaluate your field fertility conditions, especially if nitrogen was applied in the fall. There can be substantial N, P, and K loss due to leaching and surface water runoff.
- Evaluate your plant populations, the damage your field experienced, and the alternatives for replanting.

In times of such heavy rains in the magnitude of "floods," regardless of the residue cover or the conservation practices, the amount of water received by the soil will exceed its absorption capacity. However, the good news is that soils with better residue cover and no-tillage have advantages over those that are tilled frequently. As shown in Figures 1 and 2, water ponding and surface runoff were more prevalent in conventional tillage fields. The first step in preventing spring soil erosion is to have a substantial blanket of crop residue from the previous harvest. As part of the residue cover assessment, use an acceptable measurement technique to determine if there will be at least 30 percent residue cover remaining after planting your crop. Refer to http://extension.agron.iastate.edu/soilmgmt [3] to use a residue estimation calculator.

Choices and consequences

What options remain under these most sensitive weather and field conditions for erosion we are experiencing? Conservation structures can be a secondary line of defense, but spend some time checking for damaged terraces, standpipes, and waterways. Extensive rain can cause significant damage to such structures and it is important to make appropriate repairs, even if the repairs are only temporary. Check if standpipes and terrace channels are in good working condition and remove any residue or debris accumulated around the outlet.

Relationship between soil-surface runoff and nutrient loss

Pollutants such as nutrients and pesticides have different transport mechanisms. The significance of extensive rain events is the degree and volume of losses of soil sediments and nutrients such as phosphorus, which can be transported attached to soil particles suspended in runoff water. Nitrate nitrogen can be transported in surface runoff, or infiltrate with water into the soil profile and be intercepted by tile lines, and then be returned to surface water by tile outflow.

The process described above leads us to examine our approach in addressing water quality issues in the state, in terms of both solutions and regulations. The issue of water quality is not going away as long as we have extreme weather to deal with. We need to address water quality issues by addressing the root-cause of the problem, which requires implementing more sound conservation practices and developing sensitive regulations that take into account weather events that may be similar or even worse than those we experienced last week. The relationship between water quality and soil erosion cannot be over-emphasized. Soil erosion and residue management, especially surface water runoff, influence water

quality. Therefore, implementation of conservation practices can be significant in controlling soil erosion and improving water quality.

This article originally appeared on pages 57-58 of the IC-492(10) -- June 7, 2004 issue.
